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## (54) MEDICAL TUBING CONNECTOR

MEDIZINISCHE SCHLAUCHKUPPLUNG

CONNECTEUR POUR TUBE MEDICAL

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## Description

### BACKGROUND OF THE INVENTION

The present invention generally relates to a connector assembly connecting a first length of tubing to a second length of tubing. More specifically, the present invention relates to a connector assembly having a hinged closure integrally formed with one component of the connector assembly.

In a variety of industries, and for a variety of applications, it is necessary to create and provide a flow path. In many situations, most specifically in the medical industry, it is necessary to create sterile fluid flow paths.

It is, of course, generally known to provide fluid delivery to a patient for a variety of purposes, such as delivery of a medicament, provide nutrition, and peritoneal dialysis and the like. Such fluid delivery necessitates in many instances the creation of sterile flow paths. Some such procedures require the sterile flow paths to be disconnected and reconnected.

For example, it is known to use a cannula or a needle to inject into a patient a solution through the use of a length of tubing which is further connected to a container housing the solution. Often, an adaptor or other connector is provided for enabling fluid communication between the container and the patient through the tubing. For example, a connector may be provided at a port on the container to connect an end of the length of tubing to the container.

It is also well known to provide solutions to a patient, such as for peritoneal dialysis. In peritoneal dialysis, a dialysis solution is introduced into the peritoneal cavity utilizing a catheter. After a sufficient period of time, an exchange of solutes between the dialysate and the blood is achieved. Fluid removal is achieved by providing a suitable osmotic gradient from the blood to the dialysate to permit water outflow from the blood. The proper acid-base electrolyte and fluid balance to be returned to the blood is achieved, and the dialysis solution is simply drained from the body cavity through the catheter.

This procedure is generally repeated three or four times daily for such a patient. Therefore, repeated connections and disconnections are required to be made from the system. Further, such a patient is often interrupted during administration of solution into the body requiring disconnection from the system.

At least three issues arise with respect to the disconnection and reconnection of a sterile flow path, such as that used for peritoneal dialysis. One requirement is that the system must provide a quick and a simple disconnection from the system. It is also required that a sterile, contaminant-free environment be maintained after disconnection. Further, the system must provide means for a simple reconnection to the system.

If dismantling of the entire setup is required, a patient generally will not permit the interruption and will continue receiving the solution ignoring the interruption. On the other hand, if the disconnection and/or reconnection cannot be performed without contaminating the system, the contaminated system components or the entire system must be replaced. In the alternative, the contaminated components of the system must be sterilized before reuse of the system. Again, therefore, the patient will ignore the interruption and continue with the administration of solution from the system.

At times, however, interruptions, such as emergencies, will require disconnection from the system. Therefore, a need exists for an improved system for simplifying disconnection and reconnection without contamination of the components of the system.

EP-A-0425911, which is used as a basis for the preamble of claim 1, discloses a tubing connector assembly comprising a first component connected to a first length of tubing and having a hollow body and a tubular portion extending within the body and an elongate second component connected at a first end to a second length of tubing and having an opening at its opposite second end, the tubular portion being matable with the opening so as to provide communication in use between said lengths of tubing, the second component having a hinged closure providing selective access to the interior of the second component through the opening, the hinged closure being rotatable between open and closed positions about an axis extending transversely to the length of the second component.

The present invention is characterised in that the first component has a longitudinal member, which extends within the hollow body, but is outside the tubular portion, and which engages the hinged closure when the components are mated together to rotate the closure from its closed position to its open position.

### BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 illustrates an environmental view of a connector assembly of the present invention in its disconnected state between a fluid source and a patient.

Figure 2 illustrates a perspective view of the female component of the connector of the present invention with the hinged closure in its sealed position.

Figure 3 illustrates a partial perspective view of the female component of the connector of the present invention with the hinged closure in its open position.

Figure 4 illustrates a perspective view of the male component of the connector of the present invention.

Figure 5 illustrates a cross-sectional view of the connector assembly immediately prior to connection between its male component and is female component.

Figure 6 illustrates a cross-sectional view of the connector assembly of the present invention with the male component and the female component connected.

Figure 7 illustrates an end view of the sleeve portion of the female component.

## DETAILED DESCRIPTION OF THE PRESENTLY PREFERRED EMBODIMENTS

There is provided a connector between two lengths of tubing or other conduit for selectively connecting and disconnecting the lengths of tubing. When connected, fluid communication is provided between a fluid source and a patient. Fluid, however, may be occluded from flowing when connected using an occluder integrally formed with the connector.

Referring now to the drawings, Figure 1 illustrates an environmental view of a system employing the connector of the present invention. The connector is generally illustrated at 1 and includes a female (second) component 10 and a male (first) component 12. As illustrated in Figure 1, in a preferred embodiment of the present invention, the female component 10 is connected to a conduit 14 which is attached via a catheter 15 to a patient 2.

The male component 12, on the other hand, in a preferred embodiment, may be connected to a Y-set generally illustrated at 18. The Y-set 18 includes two flexible containers 20a, 20b. Typically, for peritoneal dialysis, one of the flexible containers, for example, the flexible container 20a, is filled with a dialysate and the other flexible container 20b is empty. The flexible containers 20a and 20b are attached to the male component 12 through a length of conduit 22 forming a portion of the Y-set 18. Clamps 24 may be provided at any point along the length of the conduit 22 to control flow of dialysate as desired. In another embodiment, the male component 12 of the connector 1 may have clamps integrated into its housing.

Referring now to Figures 2 and 3, the female component 10 of the connector 1 is illustrated. The female component 10 has an exterior dimension designed to fit within an opening 26 of the male component 12. The female component includes a hinged door 28 rotatable about a hinge 30. The hinge 30 allows the door 28 to rotate approximately 90° to the position shown in Figure 3.

As mentioned, the exterior of the female component 10 is designed to fit within the opening of the male component 12 in sliding engagement. Further, the exterior of the female component 10 is designed such that only one orientation of the female component 10 may be received within the opening 26 of the male component 12.

The female component 10 further includes a sleeve 32 capable of axial rotation about the conduit 14. In the position illustrated in Figure 2, the conduit 14 is pinched closed by a pair of arms within the sleeve 32 which will be described hereinafter with reference to Figures 5, 6 and 7.

Referring now to Figure 4, the male component 12 is illustrated having a longitudinal member 34 extending within the opening 26 and a tubular member 36 extending substantially parallel to the longitudinal member 34 within the opening 26. The longitudinal member 34, during connection of the male component 12 to the female component 10, forces rotation of the door 28 about the hinge 30. The tubular member 36 is guided into the opening 38 (see Figure 3) of the female component 10 providing fluid communication through the male component 12 and the female component 10.

The door 28 maintains a seal against a surface 40 including the opening 38 via a spring 42. The spring 42 provides tension to maintain the door 28 in the position illustrated in Figure 2. Insertion of the female component 10 into the male component 12 acts against the tension in the spring 42 of the door 28 causing the door 28 to open allowing the tubular member 36 to be inserted into the opening 38 of the female component 10.

In another embodiment of the present invention, a snap detent may 39 replace the spring 42 or supplement the spring 42 to hold the hinged door 28 in the position shown in Figure 2. The snap detent 39 is generally known in the art. The snap detent 39 is circumferentially formed as a ridge around the inner circumference of the female component 10. The ridge is formed at a point within the female component 10 where the door 28 is snap fitted in a closed position. Further, the door 28 may be impregnated with an antimicrobial agent to enhance the aseptic procedure during opening and closing of the door 28.

As the female component 10 and the male component 12 are further engaged following opening of the door 28, the tubular member 36 of the male component 12 is sealingly engaged into the opening 38 of the female connector 10. To this end, the opening 38 may be luer tapered to assist in the sealing engagement of the same. In another embodiment, the opening 38 may include an O-ring to maintain the seal therebetween.

Referring now to Figures 5 and 6, the connector 1 is shown immediately prior to connection of the female component 10 to the male component 12 (Figure 5) and after connection therebetween (Figure 6). The distinction between the connection and disconnection of the female component 10 and the male component 12 is most clearly evident by the position of the door 28.

In the closed position, the door 28 is substantially parallel to an end face of the female component 10 and sealingly covers the opening 38 to which the tubular component 34 connects in fluid communication. The opening 26 or reservoir of the male component 12 separates the tubular member 36 from the longitudinal member 34. When connection of the male component 12 is desired with the female component 10, the male component 12 is slidingly engaged around the female component 12 allowing the longitudinal member 34 to force the door 28 to rotate about the hinge 30.

When the male component 12 is secured over the female component 10 as shown in Figure 6, the door 28 is perpendicularly disposed with respect to an end face thereof. The opening 26 or reservoir is constructed and

arranged to allow a clearance for the door 28 to swing therein as shown in Figure 6. After connection of the male component 12 to the female component 10, fluid communication between the Y-set 18 and the patient is achieved.

The female component 10 further includes a sleeve 44 partially rotatable about an axis parallel to a length of the conduit 14 between the female component 10 and the patient 2. Within the sleeve 44 are a pair of longitudinal members 46. The sleeve 44 rotates about the axis thereby deflecting the position of the longitudinal members 46 in a conduit compressed position and a flowing position.

To this end, an opening 50 is provided at an end face of the sleeve 44 as shown in Figure 7. The end face is constructed and arranged such that in one position the end of the longitudinal members 46 are compressed thereby compressing the conduit 14 and, in another rotated position, the longitudinal members 46 are fully expanded into the opening 50 allowing fluid to flow through the conduit 14.

In an embodiment, the opening 50 is rectangular as illustrated in Figure 7. The conduit 14 is, therefore, compressed as shown with the opening 50 in the position illustrated. When the sleeve 44 is rotated 90°, the opening 50 rotates 90° as well. The leg 46 thereby expands into the length of the rectangular opening 50 allowing fluid to flow through the conduit 14.

## Claims

1. A tubing connector assembly comprising a first component (12) connected to a first length of tubing (22) and having a hollow body and a tubular portion (36) extending within the body, and an elongate second component (10) connected at a first end to a second length of tubing (14) and having an opening (38) at its opposite second end, the tubular portion (36) being matable with the opening (38) so as to provide communication in use between said lengths of tubing (22,14), the second component having a hinged closure (28) providing selective access to the interior of the second component (10) through the opening (38), the hinged closure (28) being rotatable between open and closed positions about an axis extending transversely to the length of the second component (10),

   characterised in that the first component (12) has a longitudinal member (34), which extends within the hollow body, but is outside the tubular portion (36), and which engages the hinged closure (28) when the components (12,10) are mated together to rotate the closure from its closed position to its open position.

2. The connector assembly of claim 1 further including a spring (42) urging the hinged closure (28) to the closed position for maintaining a seal.

3. The connector assembly of claim 1 or 2 including a snap detent (39) formed as a ridge around the inner circumference of the second component (10) to maintain a seal with the hinged closure (28).

4. The connector assembly of any preceding claim wherein the opening (38) of the second component (10) includes an O-ring.

5. The connector assembly of claim 1 wherein the opening (38) of the second component (10) has a luer taper.

6. The connector assembly of any preceding claim further comprising:

   a clamp (44, 46) at an end of the first component (12) or the second component (10), for selectively occluding flow through tubing attached to the component.

7. The connector assembly of claim 6 wherein the clamp (44, 46) includes an element (44) rotatable about an axis defined along a length of the tubing for moving the clamp between occluding and non-occluding positions.

8. The connector assembly of any preceding claim, wherein the hinged closure (28) is antimicrobially impregnated.

9. The connector assembly of any preceding claim, wherein the first component (12) and the second component (10) are constructed and arranged to prevent misalignment during mating.

## Patentansprüche

1. Schlauchverbindung umfassend eine erste Komponente (12), die mit einem ersten Schlauchstück (22) verbunden ist und ein hohles Gehäuse und einen röhrenförmigen Teil (36) innerhalb des Gehäuses aufweist, und eine längliche zweite Komponente (10), die an einem ersten Ende an ein zweites Schlauchstück (14) verbunden ist, und an ihrem gegenüberliegenden zweiten Ende eine Öffnung (38) aufweist, wobei der röhrenförmige Teil (36) mit der Öffnung (38) verbindbar ist, um bei der Verwendung zwischen den Schlauchstücken (22,14) eine Verbindung auszubilden, und die zweite Komponente einen klappbaren Verschluss (28) aufweist, der einen selektiven Zugang zum Inneren der zweiten Komponente (10) durch die Öffnung (38) ermöglicht, und der klappbare Verschluss (28) zwischen offenen und geschlossenen Positionen um eine zur Längsrichtung der zweiten Komponente (10) transversale Achse drehbar ist,
   dadurch gekennzeichnet, dass die erste Kompo-

nente (12) ein längliches Element (34) aufweist, das innerhalb des hohlen Gehäuses verläuft, aber ausserhalb des röhrenförmigen Teils (36) ist, und in den klappbaren Verschluss (28) eingreift, wenn die Komponenten (12,10) miteinander verbunden werden, um den Verschluss aus der geschlossenen Position in die offene Position zu drehen.

2. Verbindung nach Anspruch 1, dadurch gekennzeichnet, dass sie ferner eine Feder (42) aufweist, die den klappbaren Verschluss (28) in die geschlossene Position zwingt, um eine Abdichtung aufrechtzuerhalten.

3. Verbindung nach Anspruch 1 oder 2, dadurch gekennzeichnet, dass sie eine Eingreifarretierung (39) zur Abdichtung mit dem klappbaren Verschluss (28) aufweist, die in Form eines Steges um den inneren Umfang der zweiten Komponente (10) ausgebildet ist.

4. Verbindung nach einem der vorhergehenden Ansprüche, dadurch gekennzeichnet, dass die Öffnung (38) der zweiten Komponente (10) einen O-Ring aufweist.

5. Verbindung nach Anspruch 1, dadurch gekennzeichnet, dass die Öffnung (38) der zweiten Komponente (10) ein Übergangsstück aufweist.

6. Verbindung nach einem der vorhergehenden Ansprüche, dadurch gekennzeichnet, dass sie ferner umfasst: eine Klemme (44,46) an einem Ende der ersten Komponente (12) oder der zweiten Komponente (10), um den Durchfluss durch den mit der Komponente verbundenen Schlauch selektiv zu unterbinden.

7. Verbindung nach Anspruch 6, dadurch gekennzeichnet, dass die Klemme (44,46) ein um eine durch die Schlauchlänge definierte Achse drehbares Element (44) aufweist, um die Klemme zwischen Absperr- und Nichtabsperr-Positionen zu bewegen.

8. Verbindung nach einem der vorhergehenden Ansprüche, dadurch gekennzeichnet, dass der klappbare Verschluss (28) antimikrobiell imprägniert ist.

9. Verbindung nach einem der vorhergehenden Ansprüche, dadurch gekennzeichnet, dass die erste Komponente (12) und die zweite Komponente (10) so konstruiert und angeordnet sind, um eine Versetzung während des Verbindens zu verhindern.

## Revendications

1. Dispositif de connexion de tube comprenant un premier composant (12), connecté à une première longueur de tube (22) et ayant un corps creux et une partie tubulaire (36) s'étendant à l'intérieur du corps, et un deuxième composant allongé (10) connecté, à une première extrémité, à une deuxième longueur de tube (14) et ayant un orifice (38) à sa deuxième extrémité opposée, la partie tubulaire (36) pouvant s 'accoupler avec l'orifice (38) afin de créer une communication en utilisation entre les dites longueurs de tube (22,14), le deuxième composant comportant un obturateur pivotant (28) qui permet un accès sélectif à l'intérieur du deuxième composant (10) à travers l'orifice (38), l'obturateur pivotant (28) pouvant pivoter entre une position ouverte et une position fermée autour d'un axe transversal à la longueur du deuxième composant (10),
caractérisé en ce que le premier composant (12) comprend un élément longitudinal (34), qui s'étend à l'intérieur du corps creux, mais est à l'extérieur de la partie tubulaire (36) , et qui attaque l'obturateur pivotant (28) lorsqu'on accouple mutuellement les composants (12,10), pour faire pivoter l'obturateur de sa position fermée à sa position ouverte.

2. Dispositif de connexion selon la revendication 1, comprenant en outre un ressort (42) qui rappelle l'obturateur pivotant (28) à la position fermée pour maintenir une étanchéité.

3. Dispositif de connexion selon la revendication 1 ou 2, comprenant un enclenchement élastique (39) sous la forme d'une saillie autour de la circonférence du deuxième composant (10) de façon à maintenir une étanchéité avec l'obturateur pivotant (28).

4. Dispositif de connexion selon une quelconque des revendications précédentes, dans lequel l'orifice (38) du deuxième composant (10) comporte un joint torique.

5. Dispositif de connexion selon la revendication 1,dans lequel l'orifice (38) du deuxième composant (10) présente un cône luer.

6. Dispositif de connexion selon une quelconque des revendications précédentes, comprenant en outre un clamp (44,46) à une extrémité du premier composant (12) ou du deuxième composant (10), pour l'occlusion sélective de l'écoulement dans le tube attaché au composant.

7. Dispositif de connexion selon la revendication 6, dans laquelle le clamp (44,46) comprend un élé-

ment (44) qui peut tourner autour d'un axe défini sur une longueur du tube pour déplacer le clamp entre une position d'occlusion et une position de non occlusion.

8. Dispositif de connexion selon une quelconque des revendications précédentes, dans lequel l'obturateur pivotant (28) est pourvu d'une imprégnation antimicrobienne.

9. Dispositif de connexion selon une quelconque des revendications précédentes, dans lequel le premier composant (12) et le deuxième composant (10) sont construits et agencés de manière à éviter un défaut d'alignement pendant l'accouplement.

FIG. 1

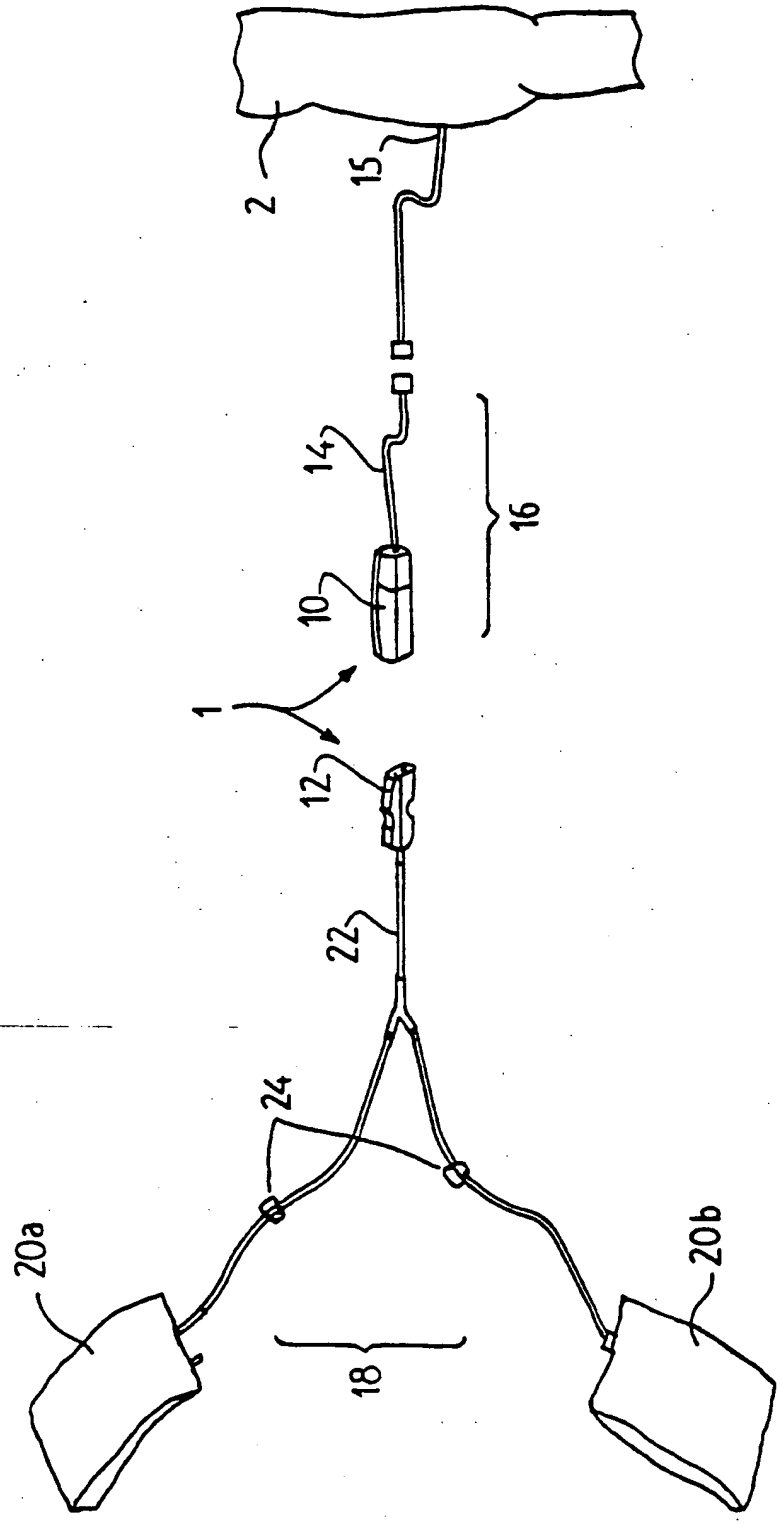


FIG. 4

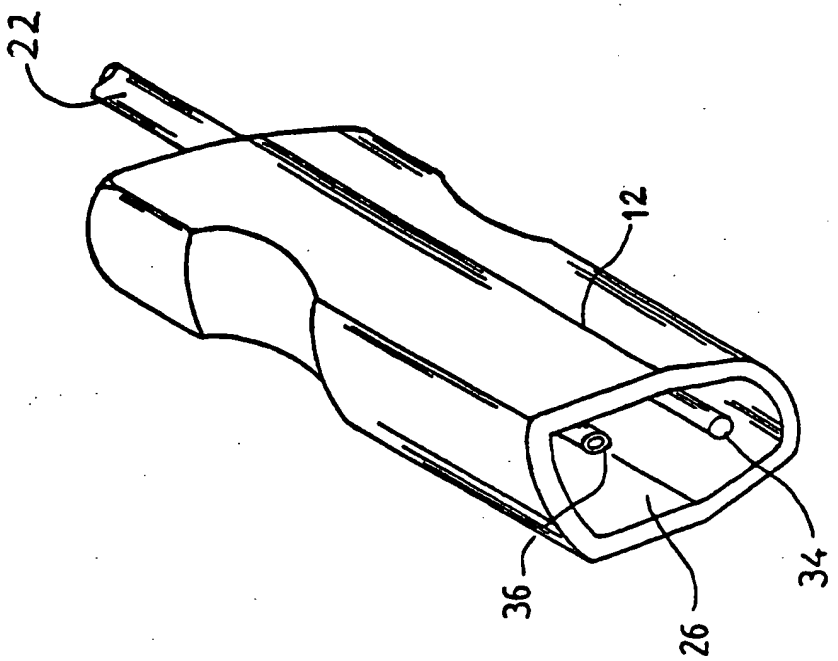



FIG. 2

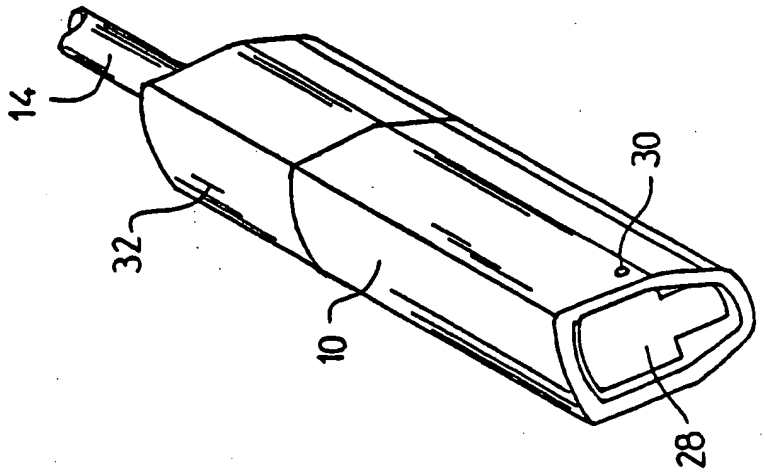
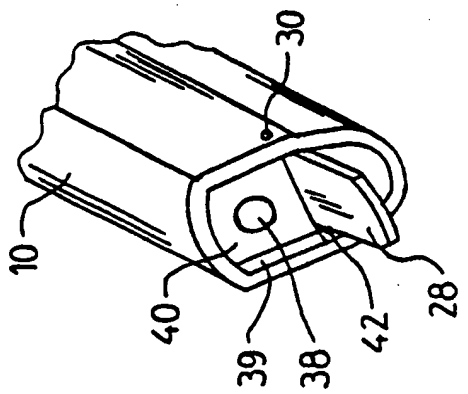



FIG. 3



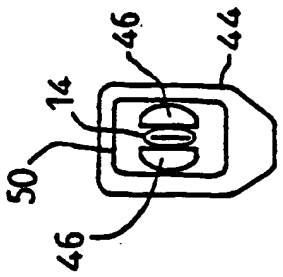



FIG 7

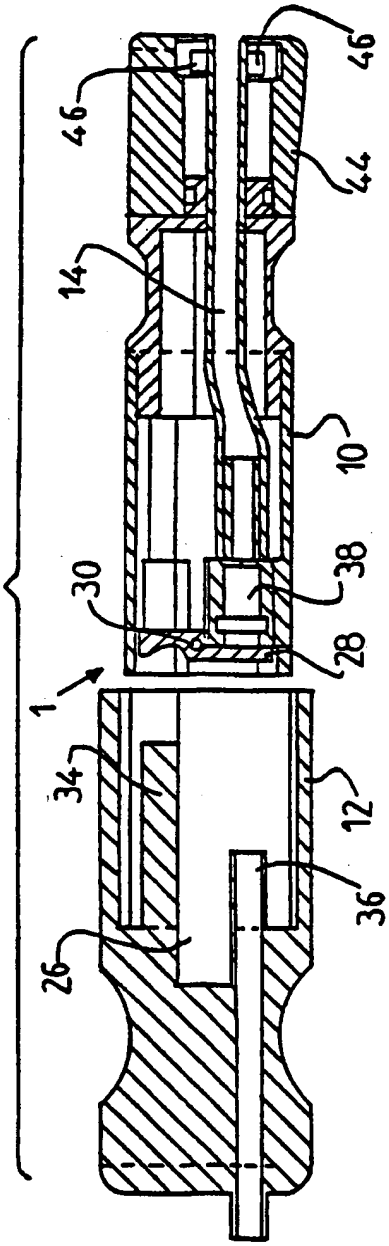



FIG 5

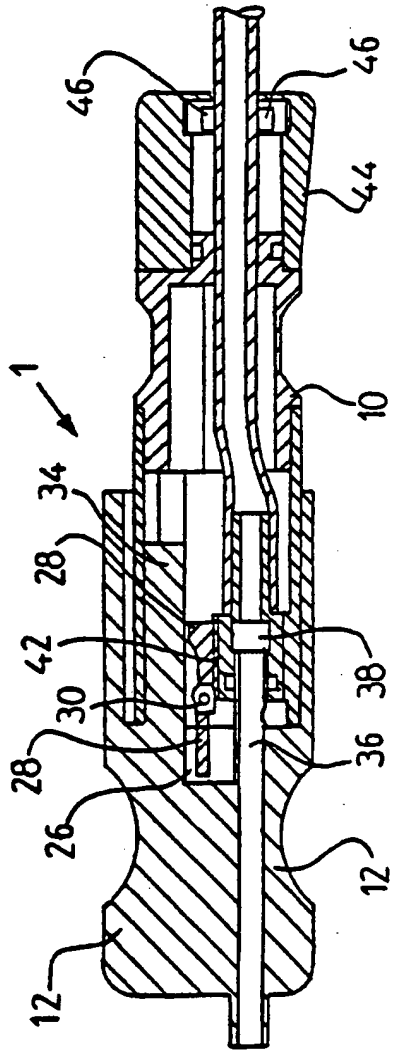



FIG 6